Enabling Bayesian Inference for the Astronomy Masses

Project Summary

Promote wider use of Bayesian and Markov Chain Monte Carlo methods in Astronomy by developing key applications and scientific notebook capabilities for the UMass Bayesian Inference Engine
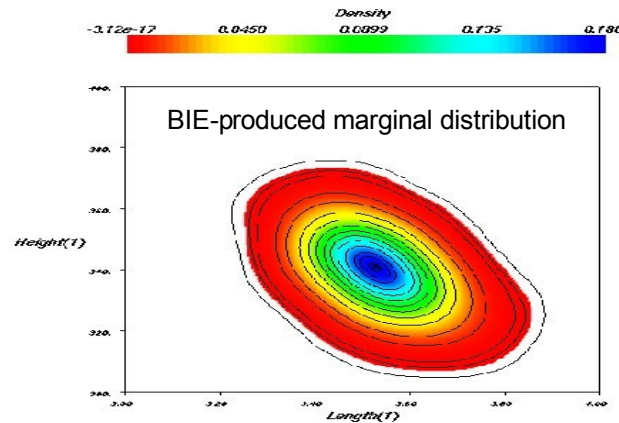
http://www.astro.umass.edu/bie

BIE-produced marginal distribution

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Impact on Science

Efficiently combine information from diverse missions and sources

Rigorously establish confidence bounds on theoretical models

Provide powerful probability-based methods for model selection and complex hypothesis testing

Work in Progress

- Developed and galaxy image "fitter" based on GALFIT
- Developed semi-analytic model for use with BIE
- Implemented parallel chains and tempered parallel chain algorithms in BIE
- Redesigning persistent object store for scientific notebook
- Showed that BIE/GALFIT decreases bias in for fits of multiple galaxy images

Near-term Plans

- Implement empirical hierarchical priors for BIE/GALFIT
- Implement Bayesian/MCMC based goodness of fit